

CLAIMS

What is claimed is:

1. A base station comprising:
means for transmitting a first spread spectrum signal having a first code;
means for receiving and analyzing an impulse response of multipath components of a second spread spectrum signal having a second code to determine a first received component, the second signal time synchronized with the first spread spectrum signal; and
means for making a distance determination based on in part a timing difference between the second code of the received second signal and the first code of the base station's transmitted first signal and the determined first received component for that base station's received second signal.
2. The base station of claim 1 wherein the first spread spectrum signal is a pilot signal.
3. The base station of claim 1 wherein the distance determination is determined by dividing the timing difference by two times a speed of light.
4. The base station of claim 1 wherein a chipping rate of the first spread spectrum signal is at least 80 ns and the timing difference is tracked with a precision of at least $1/16^{\text{th}}$ of a chip.
5. A base station comprising:
a plurality of antennas, each of the antennas separated by a known distance;
means for transmitting a first spread spectrum signal having a first code;
means for receiving, using the plurality of antennas, and analyzing an impulse response of multipath components of a second spread spectrum signal having a second code

to determine a first received component, the second signal time synchronized with the first spread spectrum signal;

means for making a distance determination based on in part a timing difference between the second code of the received second signal and the first code of the base station's transmitted first signal and the determined first received component for that base station's received second signal;

means for comparing a phase difference of a carrier signal of the second spread spectrum signal as received by each of the plurality of antennas; and

means for determining an angle of the received second signal using the distance determination and the phase difference.

6. The base station of claim 1 wherein the first spread spectrum signal is a pilot signal.

7. The base station of claim 1 wherein two of the antennas are separated by a distance 1, the carrier phase difference is ϕ , a wave length of the carrier is λ and a value m is per

$$m = \frac{\phi \cdot \lambda}{2\pi}$$

and the determined angle α is per

$$\alpha = \cos^{-1} (m / 1).$$